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Non-normal fluid mode and its explosive burst in H-mode plasma boundary[1] GUNSU YUN, JIEN LEE, MINHO KIM, MINUK LEE, Pohang University of Science and Technology, JAEHYUN LEE, National Fusion Research Institute, JEONG-YOUNG JI, Utah State University, Logan, KSTAR TEAM — The steep pressure boundary of H-mode tokamak plasma is dynamically unstable with a strong imprint of edge localized mode (ELM) instabilities and the related fast loss of edge confinement called ELM crash. On the KSTAR tokamak, distinct features of the ELM dynamics have been uncovered by the mm-wave imaging diagnostics and high-resolution RF spectroscopy system: quasi-steady filaments with eigenmode structure, transitions between quasi-steady states, and abrupt transition to non-modal solitary flux tube of low toroidal mode number, and finally the burst of the solitary tube. The changes of the fluid modes are accompanied by changes in turbulence and emissions of ion cyclotron harmonic waves, which can be attributed to time-varying perpendicular flow shear as the key parameter controlling the dynamical states. The burst of the solitary tube involves strong whistler-range emissions implying a localized magnetic reconnection. A model of collisionless fast reconnection incorporating both finite viscosity and radiative loss is proposed to explain the burst time scale of the solitary tube.

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